

WHAT IS CLAIMED IS:

1 1. A method for communicating in a wireless multi-hop system having at
2 least one base station, at least one relay station, and user equipment, the method
3 comprising:

4 communicating between a relay station and a base station using a first
5 radio interface;

6 communicating between user equipment and the relay station using a
7 second radio interface; and

8 processing the communication between the relay station and the base
9 station with the first radio interface separately from the communication between
10 user equipment and the relay station.

1 2. The method claim 1, further comprising multiplexing communication
2 between the relay station and the base station and between the relay station and
3 at least one other relay station to create multiple simultaneous data streams.

1 3. The method of claim 2, wherein the relay station is not directly
2 connected to the base station but is connected to the base station through at least
3 two different relay stations.

1 4. The method of claim 2, further comprising communicating between
2 the relay station and multiple base stations.

1 5. The method of claim 4, further comprising dynamically reusing
2 communication resources between the user equipment the multiple relay stations.

1 6. The method of claim 1, wherein communicating between user
2 equipment and the relay station comprises communicating a relay station specific
3 pilot signal.

1 7. The method of claim 1, wherein the second radio interface comprises
2 multiple input multiple output transmissions.

1 8. The method of claim 1, wherein the first radio interface and the
2 second radio interface operate using a common frequency bandwidth.

1 9. The method of claim 1, wherein the first radio interface comprise a
2 macroscopic multiplexing where the relay station is connected to the base station
3 directly and also via at least one other relay station.

1 10. The method of claim 1, further comprising sharing resources between
2 communication using the first radio interface and communication using the second
3 radio interface, wherein the first radio interface and the second radio interface
4 operate using different categories of communication links.

1 11. The method of claim 10, wherein the different categories of
2 communication links comprises multi-carrier modulation, spread-spectrum
3 transmission, frequency division duplexing, and time division duplexing.

1 12. A wireless communication system having a base station and a relay
2 station that communicate with user equipment, the system comprising:

3 a base station having a first radio transceiver and being connected to a
4 core network;

5 a relay station having a second radio transceiver and being configured
6 to communicate with the base station using a first radio interface; and

7 user equipment having a third radio transceiver and being configured
8 to communicate with the relay station using a second radio interface, wherein the
9 operation of the first radio interface and the second radio interface are separate
10 from each other.

1 13. The system of claim 12, wherein the operation of the first radio
2 interface and the second radio interface includes, at least in part, using the same
3 frequency bandwidth.

1 14. The system of claim 12, further comprising at least one other relay
2 station being configured to communicate with the relay station and the base
3 station.

1 15. The system of claim 14, wherein the relay station communicates with
2 the base station directly and simultaneously via the at least one other relay station.

1 16. The system of claim 15, wherein the relay station is not directly
2 connected to the base station but is connected to the base station through at least
3 one different relay station.

1 17. A device configured for operation in a wireless multi-hop
2 communication environment, the device comprising:

3 a radio interface that communicates with relay stations in a multi-hop
4 communication environment; and

5 a processor coupled to the radio interface, the processor providing
6 commands for multiple input, multiple output communication via the radio interface
7 when high data rates are needed.

1 18. The device of claim 17, wherein the radio interface comprises multiple
2 antennas.

1 19. The device of claim 17, wherein the radio interface communicates a
2 relay station specific pilot signal.

1 20. The device of claim 17, further comprising a memory apparatus
2 containing identification information.

1 21. The device of claim 17, wherein the radio interface communicates
2 using time division multiple access.

1 22. A device configured for operation in a wireless multi-hop
2 communication network, the device comprising:

3 a radio interface that communicates with user equipment and other
4 network devices in a multi-hop communication network; and

5 a processor coupled to the radio interface, the processor providing
6 commands for multiple input, multiple output communication via the radio interface
7 when high data rates are needed.

1 23. The device of claim 22, wherein the radio interface comprises multiple
2 antennas.

 24. The device of claim 22, wherein the radio interface receives a
 relay station specific pilot signal and compares the relay station specific pilot
 signal with an identification signal.